Exemption No. **1870E**

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
RENTON, WASHINGTON 98055-4056

In the matter of the petition of

BOEING COMMERCIAL AIRPLANE GROUP

Regulatory Docket No. 13203

for an exemption from §§ 25.807(c)(1) and (c)(5), 25.809(f)(1), and 25.813(b) of the Federal Aviation Regulations

GRANT OF EXEMPTION

By letters B-T02T-92-0757 dated July 8, 1992, and B-T02T-93-1296 dated July 27, 1993, Mr. K. B. Buchanan, Manager, Airworthiness, Organization B-T02T, Mail Stop 05-02, Boeing Commercial Airplane Group, P.O. Box 3707, Seattle, Washington 98124-2207 petitioned for an amendment of Exemption No. 1870D, to include the Model 747-400F (Freighter), and for carriage on its upper deck of up to six persons in addition to the two flight crewmembers.

Sections of the FAR affected:

> Section 25.807(c)(1), Amendment 25-67 effective July 24, 1989, provides, in part, that an airplane having a passenger seating capacity (crewmember seating excluded) of one through nine must have at least one Type IV emergency exit for each side of the fuselage.
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> Section 25.807(c)(5) further specifies that for airplanes on which the vertical location of the wing does not allow the installation of overwing exits, an exit of at least the dimensions of a Type III exit must be installed instead of each Type IV exit required by § 25.807(c)(1).
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> Section 25.809(f)(1), Amendment 25-47 effective December 24, 1979, requires, in part pertinent to the certification basis of the 747-400F, that each passenger emergency exit (other than overwing exits) located more than 6 feet from the ground must be provided with a self-supporting slide or equivalent to assist the occupants in descending to the ground. It further defines certain criteria for the assist means: automatic deployment capabilities; maximum erection times; and, usability under certain landing gear collapse conditions and 25-knot wind conditions. Section 25.809(f)(1)(v) testing requirements are excepted.

Section 25.813(b), Amendment 25-46 effective December 1, 1978, provides, in part, that there must be enough space next to each exit located more than 6 feet from the ground to allow a crewmember to assist in the evacuation of passengers without reducing the unobstructed width of the passageway below that required for the exit.

Related Sections of the FAR:

Section 25.805 provides that for airplanes with a passenger capacity of 20 or less in which the proximity of passenger emergency exits to the flightcrew area offers a convenient and readily accessible means of evacuation for the flightcrew, there must be either one exit on each side of the airplane or a top hatch, in the flightcrew area. Exit size and location are further specified.

Section 25.809(f)(2), Amendment 25-47 effective December 24, 1979, provides that the assisting means for flightcrew emergency exits may be a rope or any other means demonstrated to be suitable for the purpose, and specifies certain requirements for this means.

The petitioner's supportive information is as follows:

By Exemption No. 1870 and subsequent amendments, FAA granted The Boeing Company relief from Sections 25.807 (c)(1) and (c)(5), 25.809 (f)(1) and 25.813 (b) of the Federal Aviation Regulations effective prior to Amendment 25-72. These exemptions permit type certification of Boeing Models 747-200F and 747-200C airplanes having an all-cargo main deck configuration, and all 747-100 and 747-200 airplanes incorporating an FAA approved modification from a passenger configuration to an all-cargo main deck configuration, for the carriage on the upper deck of not more than five (5) persons other than flight crewmembers. The exemptions include a limit on total upper deck occupancy of eight (8) and also define the categories of persons who may be carried.

"We hereby submit a petition for a further amendment to Exemption No. 1870D to permit the carriage of up to six persons on the upper deck of Model 747-400F airplanes having an all-cargo main deck configuration. The total complement, flight crew plus additional persons, will be limited to eight as currently approved, i.e., five flight crew plus three persons, four flight crew plus four persons, three flight crew plus five persons (as existing exemption), or two flight crew plus six persons.

"Boeing Proposal: Boeing proposes that the Airplane Flight Manual operating limitations be revised to permit the carriage of up to six persons other than flight crew members in the upper deck cabin of the 747-400F with the total complement of flight crew plus additional persons not to exceed eight. The limitations relating to categories of persons who may be carried will be unchanged.

"Justification: This petition is merely a request for adjustment of the

ratio of flight crew members to other persons to be carried on some 747-400 cargo missions. The current limitations require the additional person to be (a) instructed in the use of, and (b) capable of using, the escape means provided. This requirement will not be changed. The existing limitations define the categories of people who may be carried and the total complement; again, will not be changed. Reducing the number of flight crew members to two and increasing the additional persons to six still provides a more than adequate ratio for leadership and control during an emergency evacuation. This was successfully demonstrated to the FAA during the 747-400F crew Evacuation Demonstration conducted on April 13, 1992. Therefore, granting the petition will not degrade the present level of safety.

"The escape provisions on the affected airplanes are unchanged from those described in Exemption 1870B, except that six body harnesses, for use with inertia reels, will be provided for the additional persons instead of the previous five. These provisions have been approved for a maximum complement of eight people. The normal (minimum) flight crew of the 747-400F consists of only two people, therefore, it is logical to permit six other persons to be accommodated on the upper deck."

In support of the extension of exemption from § 25.809(f) to the Model 747-400F, Boeing has surveyed airlines with 747-200F/-200C fleets. The vast majority of the airplanes, 50 out of 73, were configured with manually deploying upper deck slides. All 747-400F customers as of July 27, 1993, have selected the same manually deploying slide. The benefits of like equipment are two fold. First is the safety benefit involving the common emergency procedure for deploying the escape slide, and second is the economic benefit of common escape slide spares and training for their crews.

"An additional factor in support of the extension of exemption from FAR 25.809(f) to the Model 747-400F is the history of favorable service experience of the manually deploying slide in the 747-200F/-200C fleet. Lastly, the higher level of training the supernumeraries receive is a supporting factor when considering the acceptability of the manually deploying slide on the 747-400F. The slide operation is a necessary part of their pre-flight instruction and it is currently a requirement that they be capable of this task."

In like manner, § 25.813(b) was exempted because the training level of these persons has been determined to be higher than that of passengers. This training level has been maintained whenever the number of persons, other than flightcrew, was increased.

"Cargo operators have a need for a variety of mission support personnel. Such personnel may be needed in flight or at locations into which their cargo airplanes operate.

"The safety and efficiency of many cargo missions are dependant upon an adequate number of trained support personnel. Currently many such

persons must travel to the cargo destination by commercial transportation. If these key people are delayed by commercial travel, the entire cargo mission may be jeopardized. The surest, most cost effective way to transport such persons is aboard the particular cargo flight they are to support.

"Therefore, the petition, if granted, will be beneficial in improving the utility of cargo airplanes and increasing the efficiency and safety of their operations; all of which are obviously in the public interest."

A summary of Boeing's July 8, 1992, petition was published in the *Federal Register* on September 28, 1992 (57 FR 44605). No comments were received.

The Federal Aviation Administration's analysis/summary is as follows:

(Note: Boeing's petition for an amendment to Exemption No. 1870D was initially assigned to existing Docket No. 13203. Upon review, however, the FAA determined that the more current certification basis of the Model 747-400F airplane from those airplanes previously addressed by Exemption No. 1870D warranted a new docket number, and the petition was therefore reassigned new Docket No. 27288. Subsequently, due to a revision to the certification basis of the 747-400F airplane that results in a closer correlation with previously affected airplanes, the petition was reassigned back to Docket No. 13203.)

In reviewing the requirements of §§ 25.807(c)(1) and (c)(5), 25.809(f)(1), and 25.813(b) relative to the design of the Model 747-400F airplane and its intended operations, the FAA notes that these requirements, as well as related requirements, were intended to address flightcrew evacuations and passenger evacuations. They did not envision the category of occupant commonly known as "supernumeraries" or "persons," who are quasi-crewmembers possessing knowledge, training, and abilities beyond that expected of passengers. Boeing's petition is considered in view of these intended occupants, as follows:

Section 25.807(c)(1) and (c)(5) requires, for passengers, a minimum of a Type III exit on each side of the fuselage. The Model 747-400F is instead equipped on the right side with a Type I crew service door, which exceeds the noted requirement for the right side of the airplane. No similar capability is provided for the left side of the airplane. However, an overhead hatch to left of centerline is located in the cockpit, which does comply with flightcrew emergency exit requirements of § 25.805. A full demonstration of this means of egress, as required by § 25.805 and in accordance with § 25.803 procedures, was successfully conducted on a Model 747-200C airplane in 1973. The test subjects participating in that demonstration were intended to represent five flightcrew and three "crew." Statistical data for line flightcrew exists to validate the selection of representative flightcrew test subjects. However, since no such data are known to exist for "crew," the test results obtained must be considered to be of limited

usefulness. The degree of usefulness decreases as the total occupant mix consists increasingly of "crew," as it is intended on the 747-400F. Consequently, notwithstanding Boeing's 1992 mini-evacuation exercise intended to demonstrate the viability of the intended occupant mix (two flightcrew, six "crew"), the efficacy of the hatch for evacuation of "crew" is more appropriately determined on an individual basis. The conditions imposed as part of this exemption reflect this determination.

Section 25.809(f)(1) requires that a self-supporting slide or equivalent must be provided to assist the occupants in descending to the ground for each passenger emergency exit located more than 6 feet from the ground. The Model 747-400F crew service door has an inflatable escape slide that is self-supporting with the landing gear extended. The overhead hatch is equipped with eight inertia reels and six harnesses (for use by the six non-flight crewmembers) not envisioned by this requirement, but are considered by the FAA to be adequate for use by flightcrew and "crew," in accordance with the requirements of § 25.809(f)(2).

Section 25.809(f)(1)(i) requires that the assist means must be automatically deployed. This has been a certification requirement applicable to all Model 747 airplanes, and has been a subject of Exemption 1870 as originally granted and as subsequently amended. However, it is noted that these documents are confusing in this regard, because none of the associated petitions or corresponding exemptions clearly indicate if exemption was sought from automatic deployment requirements, or, if it was granted. In any event, whether initially intended or not, the result has been that the majority of affected airplanes in service are equipped with manually deployed slides. No adverse experience has been reported with these manually deployed slides provided for specially trained "crew," which suggests the validity of a determination at this point to continue to allow them. The FAA therefore concurs with the petitioner's arguments for continuing to allow manually deployed slides in lieu of automatically deployed slides. The manually deployed inertia reels for the overhead hatch are not considered subject to this requirement.

Section 25.809(f)(1)(ii) requires that the assist means must be automatically erected within 10 seconds after deployment is begun. Both the automatically and manually deployed escape slide designs for the crew service door meet this requirement. The inertia reels do not erect, and are not considered to be subject to this requirement.

Section 25.809(f)(1)(iii) requires that the assist means must be of such length after full deployment that the lower end is self-supporting on the ground and provides safe evacuation of occupants to the ground after collapse of one or more legs of the landing gear. Neither design of the escape slides for the crew service door are self supporting on the ground in all cases of gear collapse, and the inertia reels are too short to reach the ground in all cases of gear collapse. However, the escape means provided have been demonstrated to be effective at providing safe evacuation of occupants to the ground.

Section 25.809(f)(1)(iv) requires certain performance capabilities in 25-knot wind conditions. The petitioner has indicated that the 747-400F slides do continue to comply with this requirement, as have slides on previously affected airplanes, and that it is not an intent to seek exemption from this requirement. Accordingly, the FAA is not addressing this requirement herein.

Section 25.813(b), regarding specific assist space requirements for passenger evacuations, has not been addressed in the 747-400F design at either the crew service door or the overhead hatch. However, the FAA concurs with the petitioner that a dedicated assist space is not necessary at the crew service door for specially trained "crew," and adequate space has been demonstrated to be available in the cockpit for flightcrew to assist "crew" in evacuating from the cockpit hatch.

In consideration of the foregoing, I find that an amendment to Exemption 1870D is in the public interest, and will not significantly affect the level of safety provided by the regulations. Therefore, pursuant to the authority contained in §§ 313(a) and 601(c) of the Federal Aviation Act of 1958, delegated to me by the Administrator (14 CFR 11.53), the petition of Boeing Commercial Airplane Group to amend Exemption 1870D to permit type certification of the Model 747-400F for the upper deck carriage of not more than six persons other than flight crewmembers (maximum occupancy of eight including flight crewmembers), when the upper deck is configured with one approved emergency exit having the dimensions of a Type I emergency exit and equipped with either a manually or automatically activated self-supporting escape slide, and one approved emergency exit hatch with inertial reels for flight crewmembers and inertia reels and harnesses for six persons, is granted subject to the following conditions:

Unless total upper deck seating, including observer's seats, inherently limits upper deck occupancy to eight (8) persons, a conspicuously located FAA-approved placard must be installed stating that upper deck occupancy is limited to eight (8) persons. In addition, the FAA-approved Airplane Flight Manual must contain an operating limitation restricting total upper deck occupancy to eight (8) persons, and occupancy by other than flight crewmembers to a maximum of six (6) persons designated by the operator, that are -

1. Included in one of the following categories:

   (a) A crewmember;

   (b) An employee of the operator;

   (c) An FAA air carrier inspector or an authorized representative of the National Transportation Safety Board who is performing official duties;

   (d) Any person determined by the operator, for the particular flight on which carried, to be necessary for:

(1) The safety of the flight;

(2) The safe handling of animals;

(3) The safe handling of radioactive materials;

(4) The security of valuable or confidential cargo;

(5) The preservation of fragile or perishable cargo;

(6) The operation of special equipment for loading or unloading cargo; or

(7) The loading or unloading of outsize cargo.

(e) A person traveling to or from an assignment by the operator involving a function described in paragraph 1(d);

(f) A person performing duty as an honor guard accompanying a shipment made by or under the authority of the United States; or

(g) A military courier, military route supervisor, military cargo contract coordinator, or a designated flight crewmember of a military cargo contract air carrier or commercial operator when carriage of such person is specifically authorized by the operator when carriage of such person is specifically authorized by the appropriate U. S. armed forces.

2. Found by the operator, in accordance with FAA-approved procedures, to have the demonstrated physical ability to use both escape means provided; and

3. Instructed by the operator, in accordance with FAA-approved procedures, on the use of both escape means provided, and briefed by a flight crewmember prior to each flight.

Issued in Renton, Washington, on

David G. Hmiel, Acting Manager,
Transport Airplane Directorate,
Aircraft Certification Service

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